REMARKS

Reconsideration and allowance of this application are respectfully requested in light of the above amendments and the following remarks.

Claims 2-6 have been cancelled. Claims 1 and 7 have been amended, and claims 8 and 9 have been newly added. Support for the amended and new claims is provided for example in the original claims, Figs. 13 and 14, and paragraph [0054] of the published specification. (It should be noted that references herein to the specification and drawings are for illustrative purposes only and are not intended to limit the scope of the invention to the referenced embodiments.)

Claims 1 and 3-7 were rejected, under 35 USC §102(e), as being anticipated by Kim et al (US 7,280,606). Claim 2 was rejected, under 35 USC § 03(a), as being unpatentable over Kim. To the extent these rejections may be deemed applicable to the amended and new claims presented herein, the Applicants respectfully traverse based on the points set forth below.

Claim 1 now recites features of original claim 2 and defines a transmission apparatus that rotates a constellation mapping position of a last transmission by a predetermined angle that is common to all constellation mapping positions, along a circumference of a circle with an intersection point of the I axis and Q axis as a center in the IQ plane, so as to determine a constellation mapping position when transmission data is retransmitted. The claimed subject matter provides an advantage of enabling changing a constellation mapping position by simple processing that applies rotation using a predetermined angle that is common to all constellation mapping positions (see paragraph [0058] of the published specification).

While acknowledging that Kim does not disclose rotating a constellation mapping position (see Office Action page 6, lines 5-7), the Office Action proposes that a skilled artisan

would find it obvious to rearrange a constellation point on a PSK constellation based on Kim's disclosure of rearranging a constellation point on a 16 QAM constellation (see page 6, lines 7-15).

However, it is noted that instant claim 1 now recites rotating a constellation mapping position of a last transmission by a predetermined angle that is common to all constellation mapping positions. In the example cited in the Office Action of a 8 PSK constellation pattern having eight constellation points lying on the circumference of a circle, with each point spaced at an equal angle from its adjacent constellation points, the angle common to all constellation points would be 360/8 = 45 degrees. Thus, with the Applicants' claimed subject matter applied to this example, retransmitted data would be represented by a constellation point that is rotated 45 degrees from the constellation point representing the initial transmission of the data.

As acknowledged in the Office Action and mentioned above, Kim does not disclose rotating a constellation mapping position. Instead, Kim discloses that the bit positions of a four-bit sequence represent different rows and columns of a 16 QAM constellation pattern in a retransmission than they do in an initial transmission so that each of the four bits is mapped to a high-reliability position of the 16 QAM constellation pattern during one of the two transmissions. More specifically, Kim discloses, in Figs. 7A and 7B, that for a bit sequence $i_1q_1i_2q_2$, bits i_1 and q_1 are mapped to high-reliability bits of the 16 QAM constellation pattern in an initial transmission and bits i_2 and q_2 are mapped to low-reliability bits of the 16 QAM constellation pattern in a retransmission (see Kim col. 3, lines 25-32, and col. 11, lines 6-9).

And moreover Kim achieves the remapping of the four bits for the retransmission through a very complex scheme. Specifically, for the initial transmission of data illustrated in Kim's Fig.

7A, a positive bit in the i_1 position indicates a constellation point in the first two columns of the constellation pattern, a positive bit in the q_1 position indicates a constellation point in the third or fourth rows of the constellation pattern, etc. For the retransmission illustrated in Fig. 7B, Kim discloses that a positive bit in the i_1 position indicates a constellation point in the second or third columns of the constellation pattern, a positive bit in the q_1 position indicates a constellation point in the second or third rows of the constellation pattern, etc.

With Kim's scheme applied to Applicants' Fig. 7, a positive bit in the first bit position of a three-bit data sequence would indicate a constellation point in the first two columns of the constellation pattern (i.e., one of constellation points 100, 110, and 111), a positive bit in the second bit position indicates a constellation point in the third or fourth rows the constellation pattern (i.e., one of constellation points 110, 111, and 010), etc. For the purpose of discussion, assume the three-bit data sequence is 110, which has an initial transmission constellation point at ±180 degrees from the I axis of Applicants' Fig. 7.

With Kim's remapping scheme of Fig. 7B applied to the 8 PSK constellation pattern of Applicants' Fig. 7, a positive bit in the first bit position of the three-bit sequence 110 indicates a constellation point in the second or third columns of the constellation pattern (i.e., one of constellation points 100, 101, and 111), a positive bit in the second bit position indicates a constellation point in the second or third rows of the constellation pattern (i.e., constellation point 110), etc. Accordingly, the "remapped" bit sequence 110 of the retransmission has the same constellation point as that of the initial transmission.

Thus, when applying Kim's constellation-pattern remapping scheme, for retransmitting data, to the 8 PSK constellation disclosed by Applicants, the remapping scheme does not actually

change the constellation point between the initial transmission and the retransmission. As a result, applying Kim's scheme to an 8 PSK constellation, as proposed in the Office Action, does not achieve the Applicants' claimed subject matter of rotating a constellation mapping position of a last transmission by a predetermined angle that is common to all constellation mapping positions, along a circumference of a circle with an intersection point of the I axis and Q axis as a center in the IQ plane, so as to determine a constellation mapping position when transmission data is retransmitted.

Since Kim does not disclose a rotational remapping scheme and the application of Kim's remapping scheme to an 8 PSK constellation pattern does not achieve the Applicants' claimed subject matter, the Applicants respectfully submit that the Office Action has impermissibly relied on the hindsight afforded by Applicants' disclosure to derive the instant claimed subject matter rather that from Kim's teaching.

Accordingly, the Applicants submit that the teachings of Kim do not anticipate or render obvious the subject matter now defined by claim 1. Independent claim 7 similarly recites the above-mentioned subject matter distinguishing apparatus claim 1 from Kim, but with respect to a method. Therefore, allowance of claims 1 and 7 and all claims dependent therefrom is warranted.

To promote a better understanding of the patentable distinctions of the present claimed subject matter over the applied references, the Applicants provide the following additional remarks.

Claim 1 now defines a transmission apparatus comprising: an arrangement determiner that determines a constellation mapping position indicating an arrangement position of each

symbol data in the IQ plane when transmission data is retransmitted so that the constellation mapping position becomes different from that in a last transmission; a data assigner that assigns transmission data to each symbol so that each symbol data with the same amplitude is arranged in the constellation mapping position determined by the arrangement determiner; and a transmitter that transmits the transmission data that is assigned to each symbol in the data assigner, wherein the arrangement determiner rotates the constellation mapping position of the last transmission by a predetermined angle that is common to all constellation mapping positions, along a circumference of a circle with an intersection point of the I axis and Q axis as a center in the IQ plane, to determine the constellation mapping point when the transmission data is retransmitted.

Claim 7 now defines a transmission method comprising the steps of: determining a constellation mapping position indicating an arrangement position of each symbol in the IQ plane when transmission data is retransmitted so that the constellation mapping position becomes different from that in a last transmission; assigning transmission data to each symbol so that each symbol data is arranged in the determined constellation mapping position; and transmitting the transmission data assigned to each symbol, wherein the constellation mapping position of the last transmission is rotated by a predetermined angle that is common to all constellation mapping positions, along a circumference of a circle with an intersection point of the I axis and Q axis as a center in the IQ plane, to determine the constellation mapping point when the transmission data is retransmitted.

In particular, as recited in amended claims 1 and 7, features of the claimed invention include rotating the constellation mapping position of the last transmission by a predetermined angle that is common to all constellation mapping positions, along the circumference of a circle

with an intersection point of the I axis and Q axis as the center in the IQ plane, to determine the constellation mapping position when the transmission data is retransmitted. The claimed subject matter supports changing the constellation mapping position by the simple process of rotation with a predetermined angle that is common to all constellation mapping positions (see paragraph [0058] of the published specification).

By contrast with the above-noted features of the Applicants' claimed invention, Kim discloses an example of changing symbol bit positions in each constellation mapping position according to the number of retransmissions, as acknowledged in the Office Action. The Office Action suggests that Kim teaches to rearrange (rotate) the constellation mapping position of the last transmission by predetermined angles (see Office Action at page 6).

However, the Applicants respectfully submit that Kim fails to disclose or suggest rotating the constellation mapping position of the last transmission by a predetermined angle that is common to all constellation mapping positions, as specified in the claims.

Upon rearranging data in bit units, Kim discloses selecting between various rearrangement patterns, including a pattern of switching only the first and second bit in each symbol, a pattern of switching only the second and third bit in each symbol, and so on (see Kim Figs. 7A-7D). That is, according to Kim, it is necessary to rearrange data with reference to a table pertaining to constellation for every retransmission, and, as a result, the processing of looking up this table for every retransmission is required.

In contrast, as described above, according to the features of the Applicants' claimed invention, it is possible to change the constellation mapping position by simply applying a rotation by a predetermined degree common to all constellation mapping positions.

Thus, the Applicants' claimed transmission processing for changing the constellation mapping position differs significantly from the teaching in Kim.

Accordingly, Kim fails to disclose or suggest the combination of features of the claimed invention. Therefore, it is submitted that the rejections applied to independent claims 1 and 7 are obviated and allowance of claims 1 and 7 and all claims dependent therefrom is deemed to be warranted.

In view of the above, it is submitted that this application is in condition for allowance, and a notice to that effect is respectfully solicited.

If any issues remain which may best be resolved through a telephone communication, the Examiner is requested to telephone the undersigned at the local Washington, D.C. telephone number listed below.

Respectfully submitted,

/James Edward Ledbetter/

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